

BIOLOGICAL EVALUATION OF SOUTHERN PINE BEETLE
ON THE FOUR NOTCH AND CHAMBERS FERRY FURTHER STUDY AREAS
ON THE NATIONAL FORESTS IN TEXAS

by

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Abstract

A biological evaluation of southern pine beetle (SPB) infestations was conducted on the Four Notch and Chambers Ferry Further Study Areas on the Sam Houston and Sabine National Forests, respectively. The Four Notch Area contains 4,650 acres of susceptible host type with a mean of 6.9 SPB spots/1000 acres of susceptible host type. The Chambers Ferry Area contains 3,728 acres of susceptible host type with a mean of 1.89 SPB spots/1000 acres of host type. Forest Pest Management recommends that actively expanding spots be evaluated on a spot-by-spot basis to determine the method of control (if any) and that a SPB suppression project be initiated on the Four Notch and Chambers Ferry Further Study Areas.

INTRODUCTION

A biological evaluation was conducted on the Four Notch and Chambers Ferry Further Study Areas on the National Forests in Texas to determine the status of southern pine beetle (*Dendroctonus frontalis* Zimm.) populations. Entomologists from Forest Pest Management (FPM), Alexandria, LA, Field Office conducted the evaluation on June 20-22, 1983, and June 29, 1983.

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The Four Notch Area is located on the Raven Ranger District (RD), Sam Houston National Forest (NF), southeast of Huntsville, TX (fig. 1) and is 5,605 acres in size. The Chambers Ferry Area is located on the Tenaha RD, the Sabine NF, east of San Augustine, TX (fig. 2) and is 4,661 acres. Both areas consist primarily of mature loblolly and shortleaf sawtimber and the major uses on both areas are recreational, primarily hiking and hunting.

Southern pine beetle (SPB) infestations have been occurring on the National Forests in Texas since the early 1960's. Subsequently, populations have fluctuated between endemic and epidemic levels on various districts. The last major peak in SPB activity on the Raven RD and the Tenaha RD occurred in 1976 and carried over into 1977 (Overgaard 1976). In 1980, there was an increase in the number of SPB infestations on the Four Notch Further Study Area and a biological evaluation was conducted (Smith 1980). However, due to hot, dry weather conditions, the spots went inactive later that year. In the fall of 1982, SPB infestations began to increase again on the Four Notch (Nettleton and Overgaard 1982).

There has not been any epidemic SPB activity on the Tenaha RD since 1977. However, in 1982 one SPB spot was located on the Chambers Ferry Further Study Area (personal communication with District Ranger).

METHOD OF EVALUATION AND ANALYSIS OF SPB INFESTATIONS

On June 8, 1983, the Doraville FPM Field Office took color infrared aerial photography of the Four Notch Further Study Area. Thirteen spots detected on the photos were randomly selected for ground checking. On June 28, 1983, the Doraville FPM Field Office sketch mapped the Chambers Ferry Further Study Area and located seven SPB spots. Three of these spots were ground checked.

Numbers of vacated and infested trees, basal area, age, height, percentage of the stand in sawtimber, and landform were recorded. This information was used to run the benefit/cost analysis and to hazard rate the stands.

Hazard Rating

All the SPB infested stands were hazard rated at the time of ground checking. This is part of FPM's effort to validate SPB hazard rating systems whenever the opportunity exists. The system used was developed on the Kisatchie National Forest by Dr. Peter Lorio of the Southern Forest Experiment Station (Lorio and Sommers 1981). It is designed for use by the National Forests in Region 8 and utilizes field data collected by the prescriber during the field procedure (FSH 2409.21d R8 Kisatchie National Forest Supplement No. 7). Due to the similar nature of the forest conditions between central Louisiana and east Texas, we feel that this hazard rating system should accurately reflect host/site/stand

SAM HOUSTON NATIONAL FOREST TEXAS

0 1 2 3 4 5 Miles

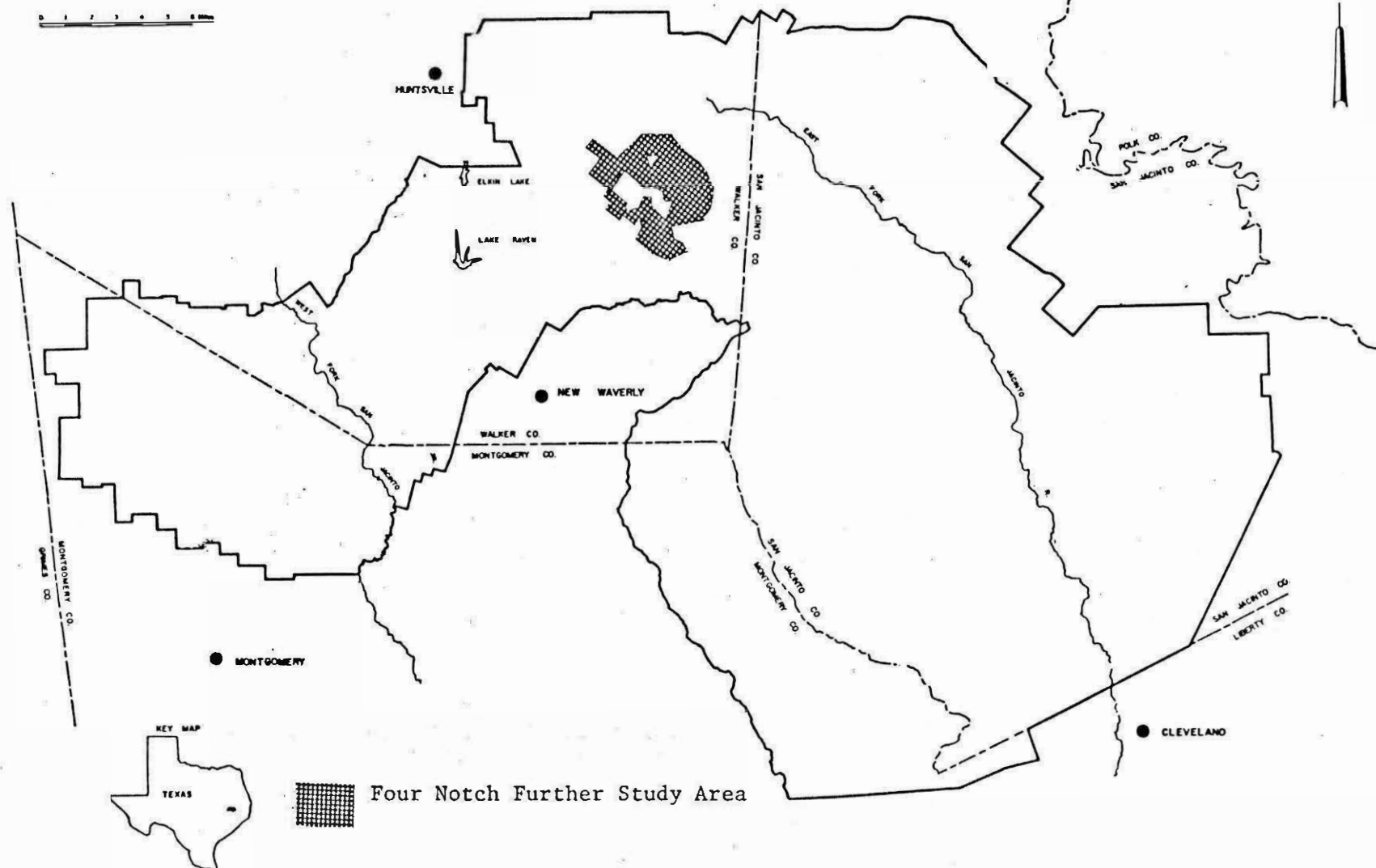
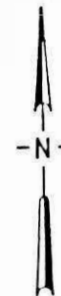
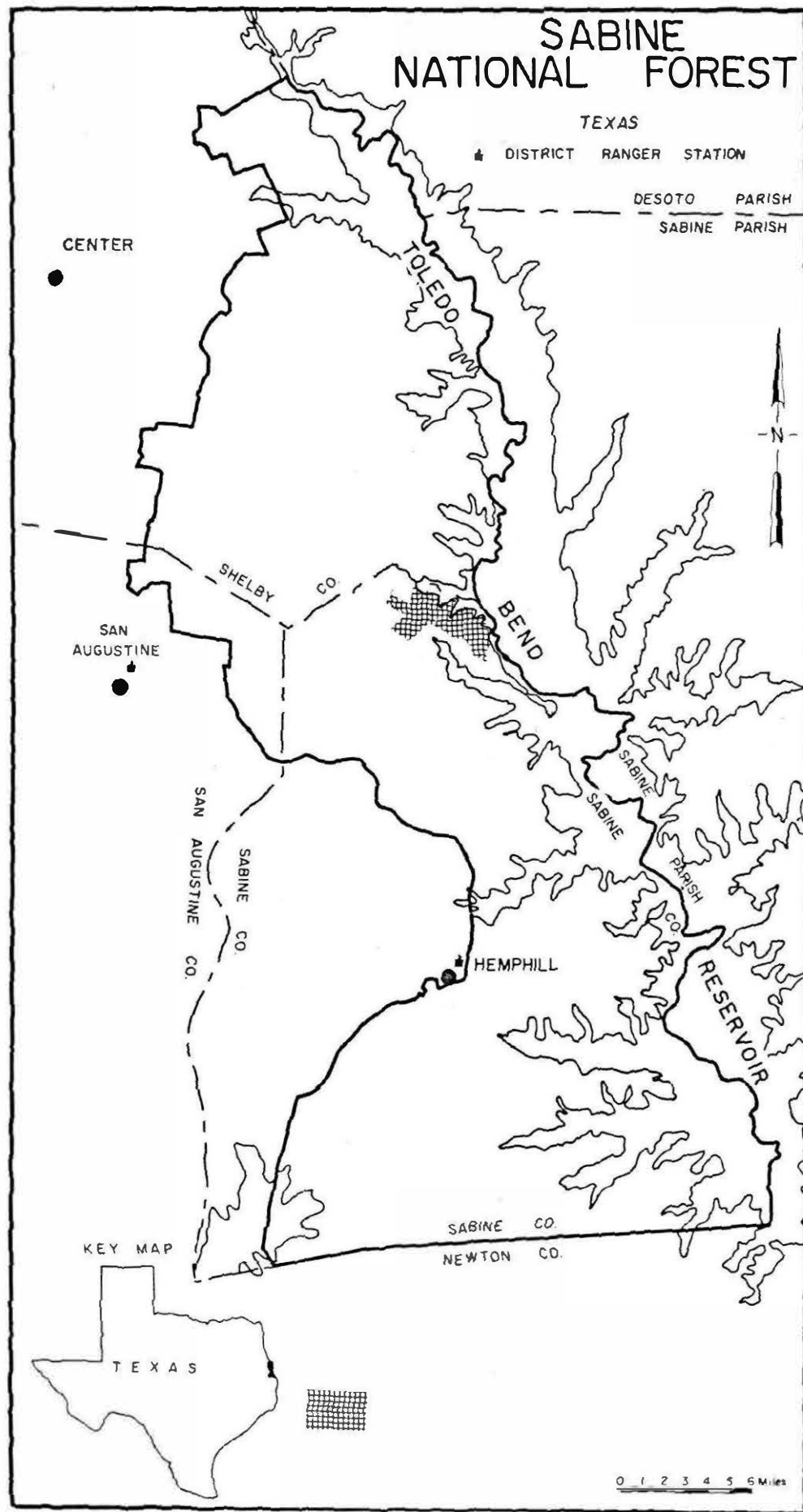


Figure 1. Location of the Four Notch Further Study Area on the Sam Houston National Forest.

Fig. 2. Location of the Chambers Ferry Further Study Area on the Sabine National Forest.



characteristics associated with SPB attack on the Raven and the Tenaha RDs.

RESULTS AND DISCUSSION

The aerial photography revealed 32 multiple tree spots on the Four Notch, and seven multiple tree spots on the Chambers Ferry. FPM and district personnel ground checked 13 active SPB spots. The three additional spots which were ground checked (one on the Four Notch, two on the Chambers Ferry) were found to contain only vacated dead trees. The data for the ground checked spots are summarized in table 1.

The spots ranged in size from 0-23,276 infested trees and the overall ratio of green infested:red infested trees was 3.92 (calculated from mean green infested and mean red infested). There is a total of 4,650 acres of susceptible host type on the Four Notch Area with a mean of 6.9 SPB spots/1,000 acres of susceptible host type, an increase of three spots/1000 acres since 1982 (Nettleton and Overgaard 1982), and a total of 3,728 acres of susceptible host type on the Chambers Ferry Area with a mean of 1.89 SPB spots/1000 acres of susceptible host type.

Trend

Of the 13 active SPB spots ground checked, 9 were predicted to have additional timber loss during the next 30 day period (table 1). The range in predicted spot growth was 0-19,740 trees.

Economic Analysis

The estimated volume of trees currently infested is 21,069 MBF. If a SPB suppression project were undertaken, it is estimated that 10,455 MBF would be removed and 20,151 MBF would be protected. For detailed information on the economic benefits with and without a project, refer to Appendix I.

Hazard Rating

Eleven of the 13 infestations evaluated on the ground rated as high or medium risk to SPB attack. Lorio found on the Kisatchie National Forest that the majority of large infestations occurred in loblolly pine stands that were immature or mature sawtimber, well stocked, and on good sites (90 or better site index). This holds true for the Four Notch and Chambers Ferry Areas as table 2 demonstrates. Spots occurring in high hazard stands have the greatest potential for timber loss and when feasible, should be controlled first.

Most National Forest ranger districts in Texas average less than 30% of their total acreage in the high and medium hazard classes. The comparison, then, between these deferred areas on the National Forests in Texas and managed National Forest land would indicate that the deferred areas are three to four times more likely to incur SPB attack than other lands managed by the USDA Forest Service.

Table 1. Summary of ground check data for the Four Notch and Chambers Ferry Further Study Areas, National Forests in Texas.

Spot No.	Total No. Trees	No. Infested Trees			No. Vacated Trees		% Infested	Green:Red Ratio ^{a/}	Total Basal Area	Additional Spot Growth Loss ^{b/}
		Total	Green	Red	Total					
1	950	800	750	50	150		84	15.00	190	914
2	7	1	1	0	6		14	-	160	0
3	134	108	84	24	26		81	3.50	90	52
4	64	60	49	11	4		94	4.45	140	44
5	168	142	114	28	26		85	4.07	160	131
6	43	38	32	6	5		88	5.33	140	25
7	7	5	2	3	2		71	0.67	90	0
8	4	3	0	3	1		75	0.00	150	0
9	4	4	0	4	0		100	0.00	130	0
10	50	38	38	0	12		76	-	90	14
11	105	85	85	0	0		81	-	120	55
12 ^{c/}	28500	23276	19475	3800	5225		82	5.13	140	19740
13 ^{c/}	1063	804	755	49	259		76	15.41	140	675
Mean	2221	1811.7	1112.5	284.1	408.7		72	6.70	131.4	1544.9

^{a/} Based on infested trees only

^{b/} Additional number of trees lost over 30 days during summer months calculated using Billings & Hynum, 1980

^{c/} Chambers Ferry

Table 2. SPB hazard rating summary for infestation locations, Four Notch and Chambers Ferry Further Study Areas, National Forests in Texas.

Spot No.	Total Basal Area	Pine Basal Area	Total Tree Height	Site Index	Diameter (in)	Age	Predominant Pine Species	SPB Hazard Rating
1	190	130	120	110	20	84	Loblolly	High
2	160	120	90	90	14	50	"	High
3	90	60	71	70	14	54	"	Low
4	140	120	100	90	20	85	"	High
5	160	150	95	90	21	83	"	High
6	140	120	90	80	14	80	"	High
7	90	90	80	70	12	45	"	Medium
8	150	120	120	110	18	90	"	High
9	130	50	120	110	24	85	"	Low
10	90	70	85	80	18	80	"	Medium
11	120	100	95	80	19	83	"	High
12	140	120	115	100	20	85	"	High
13*	140	120	100	87	18	80	"	High
Mean	131	104	98.6	90	17.4	76		

*Spot evaluated on the Chambers Ferry Further Study Area.

RECOMMENDATIONS

Large areas of contiguous old growth, high density pine sawtimber such as those found on the Four Notch and Chambers Ferry Areas, are highly susceptible to bark beetle attack. If large infestations within these areas are not controlled, SPB populations could expand rapidly and threaten both privately owned and National Forest managed stands.

All of the ground checked spots on both areas are within 1/4 mile of private or National Forest managed stands, and the benefits accrued from control actions that protect existing stands are particularly relevant for these areas. Additional costs of control can be defrayed by salvaging from those spots that are accessible.

Since a rapid response is important, a modification of the cut-and-leave approach may be justified. This would involve the cut-and-leave procedure in those areas that are accessible, followed by salvage once other high priority areas are treated. Salvage should be completed within a month of cutting.

Cut-and-leave should be used only during the period when SPB spots are rapidly expanding (May 1 to September 30). These spots should be treated using chemical control measures at the time of cutting during the remainder of the year.

An intangible benefit that could not be included in the benefit/cost analysis is the potential loss of red cockaded woodpecker habitat. Stands in the Further Study Areas are prime habitat for this endangered species and if SPB populations remain high for a long period of time much habitat would be destroyed. Our benefit/cost analysis does not include intangible benefits or costs in the calculations. The benefits reported here result from the reduced timber resource loss and the value of that protected and salvaged resource.

Many SPB infestations within the Four Notch and Chambers Ferry Areas were not ground checked at the time of the evaluation and should be located by district personnel and checked for spot growth potential using the Texas Forest Service Circular 249 (Billings and Hynum 1980) and Southern Pine Beetle Fact Sheet No. 3 (USDA Forest Service 1979). This will aid RD personnel in determining whether or not to expect additional timber losses. Before a selection of a method of insect control (if any) is made, the decision key presented in the Environmental Assessment Report, June 1983, should be used to evaluate the need for control action (Appendix II). For a more detailed description of control alternatives for SPB refer to Appendix III.

PRECAUTIONARY STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in their original containers under lock and key out of reach of children and animals, and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear appropriate protective clothing.

If your hands become contaminated with a pesticide, wash them immediately with soap and water. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove the clothing immediately and wash skin thoroughly. After handling or spraying pesticides, do not eat or drink until you have washed with soap and water.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicide from equipment, do not use the same equipment for insecticides or fungicides that you used for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary landfill dump, or crush and bury them in a level, isolated place.

NOTE: Some states have restrictions on the use of certain pesticides. Check your state and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agent, state extension specialist or FPM to be sure it is still registered for the intended use. For further information or assistance, contact Forest Pest Management, Alexandria Field Office, Pineville, La., 71360, (Telephone: FTS 497-7280, or Commercial 318/473-7280).

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- U.S. Department of Agriculture, Forest Service. Environmental Assessment Report Southern Pine Beetle Control in Proposed Wilderness Areas and Further Planning - Wilderness Areas, National Forests in Texas. Atlanta, GA: U.S. Depart. Agric. For. Serv.; June 1983. 78 p.

APPENDIX I

Southern Pine Beetle Economic Evaluation
for the Four Notch and Chambers Ferry Further Study Areas
at 4% Discount Rate

WITHOUT A PROJECT^{1/}

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
50	S/F	14636	4.82	70529	.5	70	74389	\$ 249	\$ 18498696	\$ 12016400
TOTAL		14636		70529			74389		\$ 18498696	\$ 12016400

VALUE OF THE VOLUME NOT SALVAGED (LOST) \$ 951364

TOTAL VALUE LOST \$ 12967764

WITH A PROJECT^{2/}

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
50	S/F	10455	4.82	50378	.5	70	53135	\$ 249	\$ 13213355	\$ 8583143
TOTAL		10455		50378			53135		\$ 13213355	\$ 8583143

VALUE OF THE VOLUME NOT SALVAGED (LOST) \$ 679546

TOTAL VALUE LOST \$ 9262689

PROJECT BENEFITS:	3705076
TOTAL PROJECT COST:	111324 ^{3/}
NET PRESENT VALUE:	3593752
BENEFIT COST RATIO:	33.28
INTERNAL RATE OF RETURN:	> 400%
COMPOSITE RATE OF RETURN:	43.03%
TARGETS	
VOLUME REMOVED (MBF):	10455
VOLUME PROTECTED (MBF):	20151

^{1/} Assume a 30% salvage level

^{2/} Assume a 50% salvage level

^{3/} Includes: Salvage sale \$85,000
Aerial photograph \$4,800
FPM funds \$21,524

Southern Pine Beetle Economic Evaluation
for the Four Notch and Chambers Ferry Further Study Areas
at 10% Discount Rate

WITHOUT A PROJECT^{1/}

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
60	S/F	14636	4.82	70529	.5	70	74389	\$ 249	\$ 18498696	\$ 6483680
TOTAL		14636		70529			74389		\$ 18498696	\$ 6483680

VALUE OF THE VOLUME NOT SALVAGED (LOST) \$ 951364

TOTAL VALUE LOST \$ 7435044

WITH A PROJECT^{2/}

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
60	S/F	10455	4.82	50378	.5	70	53135	\$ 249	\$ 13213355	\$ 4631200
TOTAL		10455		50378			53135		\$ 13213355	\$ 4631200

VALUE OF THE VOLUME NOT SALVAGED (LOST) \$ 679546

TOTAL VALUE LOST \$ 5310746

PROJECT BENEFITS:	2124298
TOTAL PROJECT COST:	111324 ^{3/}
NET PRESENT VALUE:	2012974
BENEFIT COST RATIO:	19.08
INTERNAL RATE OF RETURN:	> 400%
COMPOSITE RATE OF RETURN:	43.82%
TARGETS	
VOLUME REMOVED (MBF):	10455
VOLUME PROTECTED (MBF):	20151

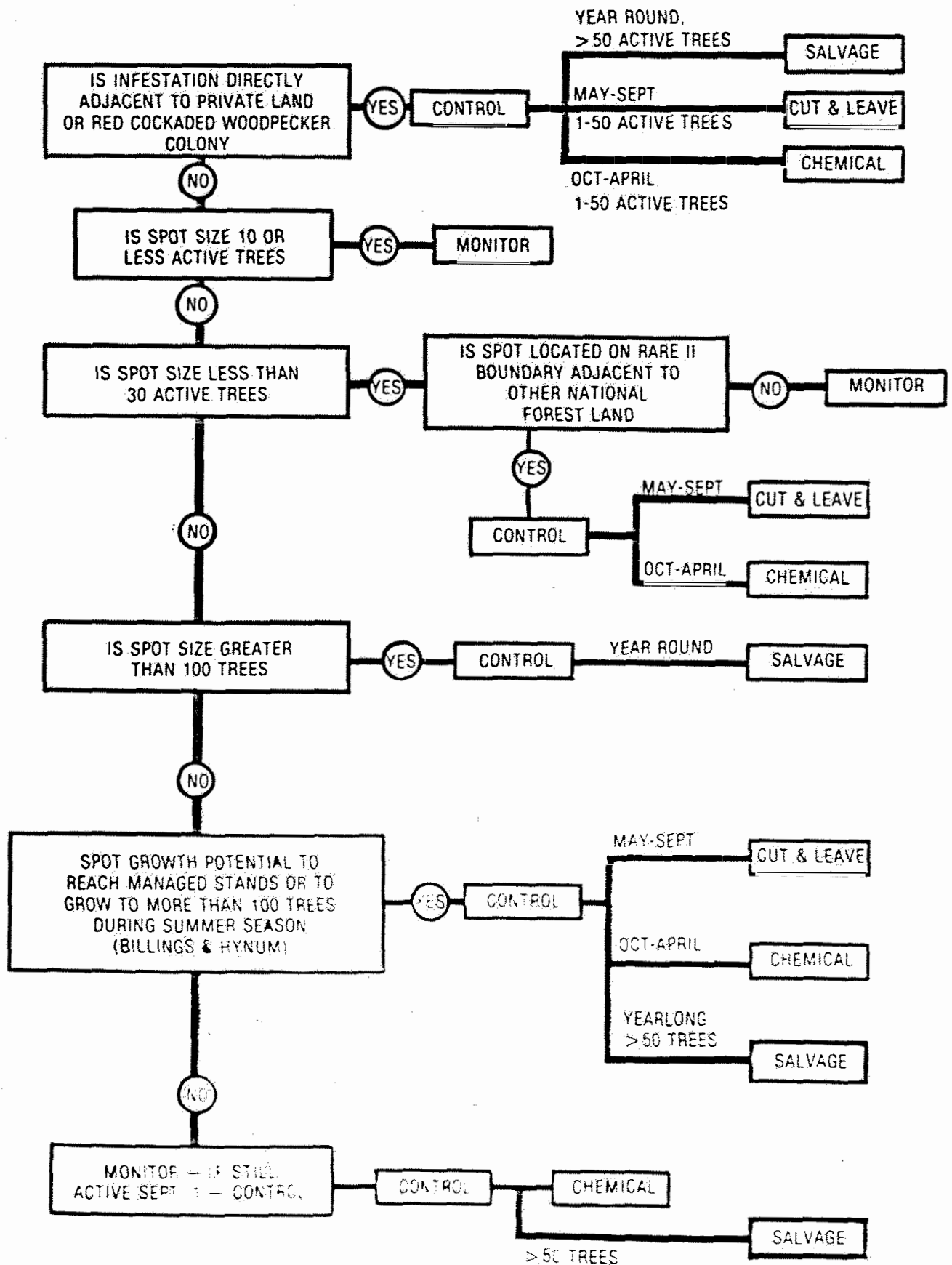
^{1/} Assume a 30% salvage level

^{2/} Assume a 50% salvage level

^{3/} Includes: Salvage sale \$85,000
Aerial photography \$4,800
FPM funds \$21,524

APPENDIX II

**Decision Key for Selection of a Method of Southern
Pine Beetle Control (if any) in Proposed Wilderness
Areas and Further Planning - Wilderness Areas
on the National Forests in Texas**



APPENDIX III

ALTERNATIVES FOR SOUTHERN PINE BEETLE CONTROL

Five alternatives are recommended for southern pine beetle control. The following discussion briefly outlines these alternatives (Swain & Remion 1980). For a more detailed description on conducting control procedures in a southern pine beetle suppression project refer to the Project Control Plan or to the southern pine beetle handbook series (Agric. Handb. Nos. 558, 560, 575, 576).

Alternative 1 - No Action. SPB populations increase periodically. Under this alternative, it is expected that the present SPB infestation would continue to spread and destroy many of the aesthetic characteristics. This may occur over one to several years. If unchecked, the beetles will create large openings of dead snags and scrub brush and greatly reduce the overall pine component. Infestations will likely spread to adjacent areas of both public and private land or serve as epicenters for population expansion. Liabilities for damage could be involved.

Standing snags create a safety hazard to visitors in the area. Violations of the Texas Forest Pest Law may occur.

Alternative 2 - Removal of infested trees and buffer strip of uninfested trees by commercial sales. When infested and buffer strip trees of merchantable size are accessible (skidding distance is a quarter of a mile or less to an existing road), they could be removed by commercial sale. Logging of the infested material should begin immediately. Where needed, a 40 to 125 foot buffer strip will be marked and cut adjacent to and ahead of the most recently infested trees. The order of priority for removing infested timber will be as follows:

- a. Trees in the buffer zone. A 40 to 125 foot buffer strip of uninfested green trees around the head of the spot is recommended for removal to minimize reinfestations and to disperse the beetles. The width of buffer zone should be approximately equal to the height of the stand being treated. With weekly monitoring of the spot after control, the buffer strip could be made even smaller or eliminated.
- b. Infested green trees. This removes the SPB pheromone source and potential brood.
- c. Faders. This removes potential brood.
- d. Red-topped. These trees contain living brood during fall and winter and should be removed. It is not necessary to remove these trees during the warmer summer months when developmental rates are much faster.

Alternative 3 - Chemical Control. Chemicals recommended for SPB are Lindane, Dursban, and Sumithion. Formulation mixtures are shown on labels. Cut, limb, buck all infested trees into workable lengths. Spray the infested bark surface to the point of run-off. A hand compressed air sprayer is an ideal applicator. Infested logs should be turned three times to insure complete treatment of infested bark. Spray cut stumps and bark removed by woodpeckers.

The order of priority for cutting and spraying infested trees in large spots is the same as stated in Alternative 2. Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts", every effort will be made to locate and treat all green infested trees during the chemical control operation.

Trees from which the brood have emerged will not be sprayed so that natural enemies of the SPB can complete their development.

Alternative 4 - Cut-and-Leave. Cut-and-leave is designed to disrupt spot growth in small to medium-sized spots (less than 50 active trees) by dispersing emerging beetles. The following procedure is to be followed when cut-and-leave is applied.

- (1) Identify all active trees within the spot.
- (2) Fell all active trees toward the center of the spot.
- (3) Fell a horseshoe-shaped buffer strip of green, uninfested trees around the most recently attacked trees at the head of the spot and leave them lying on the ground with crowns pointed toward the center of the spot. The buffer should be no wider than the average height of the trees in the spot.
- (4) Dead trees from which all SPB have emerged need not be felled. Cut-and-leave treatments, for best results, should be applied during the summer months only (June-October).

In spots > 50 active trees, where cut-and-leave is the only treatment option, cut-and-leave can be administered. Each spot treated must be checked at one week intervals for 4 weeks and treated again, if necessary.

- (4) Alternative 5 - Pile-and-Burn. Felling, piling, and thoroughly burning the bark of infested trees is one of the oldest methods of controlling SPB. The entire bark surface must be thoroughly burned to insure effective control. The order of priority for cutting, piling and burning infested trees, particularly in large spots, is the same as stated above under removal of infested trees by commercial sale. Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts", every effort will be made to locate and treat all green infested trees during the piling and

burning operation. Burning should not be done if it will result in soil erosion.

Alternative 6 - A combination of 2, 3, 4 & 5. This alternative covers all the situations and control measures to detect and control the SPB.

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